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The relationship of selected factors to academic achievement in economics.

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THE RELATIONSHIP OF SELECTED FACTORS TO ACADEMIC ACHIEVEMENT IN ECONOMICS

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R. P. B.

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C H A P T E R I

INTRODUCTION

The choice of a major field of study in college would seem to have far-reaching consequences for a student. This decision will chart the course of his college career and may determine his life-long career. The purpose of this study has been an attempt to enlarge the knowledge upon which the decision to major in the field of economics is made by college students.

Statement of the Problem

The problem undertaken in this study was to identify factors from the background of students which are associated with academic achievement in economics for junior and senior undergraduate majors. The problem involved the development of a multiple regression equation which could be used to predict the probable achievement of students planning to major in economics.

The factors selected in this study included:

1. Age of student
2. Sex of student
3. Community college attendance in first two years
4. Timing of decision to major in economics
5. College Entrance Examination Board Scores in the Verbal Aptitude Test
6. College Entrance Examination Board Scores in the Mathematical Aptitude Test
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8. High school rank
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12. Units of mathematics in high school
13. GPA of the freshman and sophomore years of college
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15. Achievement in the social sciences in college
16. Semester hours in the social sciences in college
17. Achievement in mathematics in college
18. Semester hours of mathematics in college
19. Interest in economics
20. Career intentions in economics

The list of variables is arranged in the following manner: biographical variables are considered first, achievement variables second, and interest and career intentions last. The guidelines for the selection of the variables will be discussed in detail in Chapter 3.

The study sought to answer the following questions:

1. What is the relationship between the selected factors and academic achievement in economics?

2. What prediction equation would result from the study of the selected variables?

Need for the Study

The outlook for longer periods of formal education in our society would seem to make a stable decision of educational and occupational goals important for the student and

and for society.[1] Research, however, indicates that a large proportion of our college undergraduates switch majors in college. Studies of college students typically report that almost half of all students change majors during their college career.[2] This oftentimes results in a waste of time, money, and talent for both the student and the educational institution.

The need for counseling and the provision of more information upon which a student in higher education may base his decision on a major field of study are areas of vital concern. Yet the United States Office of Education has reported that students were almost unanimous in voicing a low opinion of the performance of counseling and guidance in higher education.[3] The majority of 2200 male college graduates surveyed indicated that their colleges could have assisted them more in the areas of educational and vocational choice.[4] In a later study by Pierson, students made their

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[1]Raymond J. Adamek and Willis Goudy, "Identification, Sex, and Change in College Major," Sociology of Education, XXXIX (Spring, 1966), 183.

[2]James A. Davis, Undergraduate Career Decisions (Chicago: Aldine Publishing Company, 1965), p. 33.

[3]Robert E. Iffert, Retention and Withdrawal of College Students, United States Office of Education Bulletin 1958, No. 1 (Washington: Government Printing Office, 1957), p. 103.

[4]Ibid, p. 44.

strongest plea for more information and assistance in the selection of their major and career.[5] When tested experimentally at the University of Missouri, a significantly greater proportion of students who had received such counseling graduated while students without such counseling had a lower graduation rate.[6]

The student who faces the decision as to whether or not a career in economics is suitable will find a vacuum in terms of hard research on the subject. In making his decision, the student and his advisor usually lack information regarding the student's potential for success in college economics. Many advisors rely upon the a priori method in their predictions for students.[7] It is assumed, for example, that achievement in mathematics will predict success in economics, since mathematical analysis is utilized in economics. There is a need to test the predictive validity of these informal assumptions. It is as important

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[5]Rowland R. Pierson, "Changes in Majors by University Students," Personnel and Guidance Journal, XI (January, 1962), 459.

[6]Robert E. Shepherd, "The Relation of Counseling and Student Problems to Graduation," Journal of Counseling Psychology, XII (Fall, 1965), 245.

[7]Warren W. Willingham, "Erroneous Assumptions in Predicting College Grades," Journal of Counseling Psychology, X (Winter, 1963), 389.

to identify those factors which are unrelated to achievement in economics as it is to identify those factors that are related, in order to clarify our present informal assumptions. The information now being used in predictions has not been predicated upon documented evidence, and the continued use of this information may be misleading to students. Too often students are encouraged or discouraged on the basis of rather tenuous evidence.

The multiple regression analysis will begin to shed some light on the preparation desirable for college work in economics. It may well be the basis for future research which could test experimentally the effect of various prerequisites for economics majors. The development of a curriculum that would make the best use of a student's potential in economics should be a highly desirable goal for economic educators.

This study focuses attention upon areas in which little investigation has taken place. In an analysis of educational research in economics, Leamer maintained, "Economic education is probably one of the most 'underdeveloped areas' in economics."[8] Most studies thus far

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[8]Laurence E. Leamer, The Economist as Teacher (Chicago: South-Western Publishing Co., 1965), p. 70.

in economic education have been limited to the introductory courses in economics, and have used the Test of Understanding in College Economics or a similar instrument as the criterion variable.[9] Research dealing with academic achievement in the advanced courses in economics has not been explored in previous studies. While there have been literally hundreds of studies which have used the freshman grade point average as the criterion, studies using the senior grade point average are almost nonexistent.[10] This study has begun the exploration into the junior and senior-level economics curriculum.

Assumptions

The assumptions considered basic to this study are:

1. It is assumed that the economics majors in the class of 1970 are similar academically to those who will be majoring in economics during the next several years at the University of Massachusetts.

2. It is assumed that a grade point average is a measure of academic achievement in economics.

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[9]Keith G. Lumsden, "Where We Now Stand," Journal of Economic Education, I (Fall, 1969), 12-19.

[10]Lloyd G. Humphreys, "The Fleeting Nature of the Prediction of College Academic Success," Journal of Educational Psychology, LIX (October, 1968), 375.

While grades represent only one aspect of academic success, and academic success represents only one aspect of intellectual accomplishment, they are, nevertheless, one of the best available measures that can reasonably be used for testing the predictor variables. Grading also represents the criterion used by most educational institutions in granting a degree, by graduate schools in selecting candidates, and by many employers in hiring graduates. The concept of grading is certainly limited, but for the present, grades are a relevant indicator of achievement in baccalaureate degree programs in economics.

Limitations

This study is limited to the senior majors in economics at the University of Massachusetts in the class of 1970. While the program at the University of Massachusetts represents a typical undergraduate program in economics in the United States,[11] any results of the study should be limited to conclusions about students at that institution.

The scope of this study includes the relationships between the selected independent variables and the criterion variable, but it does not mean to imply that these are the

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[11] L. H. Mai, "Undergraduate Studies of Economics in the United States," American Economist, VIII (Winter, 1965), 35.

only relationships that may exist.

Definitions

In the interest of clarity, the following terms used in this study will have the meaning indicated below:

Criterion variable: This term refers to the dependent variable. In this study a three-semester grade point average in economics (5th, 6th, and 7th semesters) is the criterion variable.

Independent variables: These are the variables used for predicting the dependent variable, i.e., the three-semester grade point average in economics.

Grade point average: (GPA) The numerical value given to the number of quality points per semester hour assigned to a specific letter grade made by a student divided by the number of credits carried. Quality points per semester hour are assigned as follows: A = 4.0, B = 3.0, C = 2.0, D = 1.0, and F = 0.0.

College Entrance Examination Board Scores: A national testing program taken by students prior to entering college. The examination consists of two parts: the Verbal Scholastic Aptitude Test and the Mathematical Scholastic Aptitude Test.

High school GPA: The high school grade point average is determined from all the marks in high school academic subjects taken in grades nine through twelve and is computed by divid-

ing the total number of grade points by the total number of units.

Differential prediction: The prediction of academic achievement in selected subjects of study.

Elementary economics: A two semester introductory course that is usually taken by students in the freshman or sophomore years of college.

Community college transfer: Those students who matriculate at the University of Massachusetts after completion of their freshman and sophomore years at one of the state-supported community colleges.

Timing of decision: The semester during which a student decided to major in economics.

C H A P T E R II

A REVIEW OF RELATED LITERATURE

Since college economics has been an area in which there has been little investigation, it was necessary to search the literature for variables that have been found related to college academic achievement. These studies attempted to assess the relationship between a variable (or variables) and success in college as measured by grade point averages.

Sex of the Student

Most studies have found academic achievement in college to be higher among female students than male students. In a study at the University of Southern Mississippi, Lucy analyzed success patterns of students over a five-year period. He concluded that sex was related to college achievement; women achieved higher college grade point averages throughout the entire study.[1] Studies by Stucky and Anderson (1959), Jones (1961), Hunt (1961), Rowlette (1964), and Gee (1967) have also found sex to be a significant variable

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[1]Herbert E. Lucy, "A Study of Selected Factors Related to the Academic Success of Undergraduate Students at the University of Southern Mississippi", (unpublished Ed.D. dissertation, University of Southern Mississippi, 1962), p. 126.

favoring female college students.[2]

Age of the Student

Generally, it has been reported that younger undergraduate students do better academically than older students. In a review of research in this area, Garrett analyzed thirteen studies which found the scholarship of younger students at the freshman and sophomore level to be slightly superior to that of average-aged students in the first two years of college. These studies revealed an average correlation of —.11 between age and academic scholarship.[3] In a study of academic success over a five-year period, Lucy found younger students, as a group, to be superior to students who had entered college at the age of nineteen.[4] Later studies by Marmas (1961) and Smith (1967) have tended to support these findings.

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[2]Supportive studies, since they are too numerous to footnote, will be referenced in the text by the author's name and the date of the study and, henceforth, will be found alphabetically in the bibliography.

[3]Harley F. Garrett, "A Review and Interpretation of Investigations of Factors Related to Scholastic Success in Colleges of Arts and Science and Teachers Colleges", Journal of Experimental Education, XVIII (December, 1949), 117.

[4]Lucy, "A Study of Selected Factors", p. 127.

The Achievement of Community College Transfers in Four-year Institutions

The grade point average of community college transfers has been found to be approximately the same as that of regular four-year students by the end of the senior year. A 1958 study by Medsker involving 2,500 community-junior college transfers found the cumulative grade point average to be nearly the same as regular four-year students by the time of graduation.[5] Similar studies at San Jose State College, Fresno State College, the University of California, the University of Southern California, the University of Georgia, the University of Illinois, the University of Mississippi, and eight four-year colleges in Iowa and Kansas have consistently found the grade point average made by the community college transfer student to be approximately equal to that of the native student by the end of the four-year period.[6] Research indicates that most transfers from two-year colleges perform less well in their first semester after transfer, but by the end of the senior year they compare favorably with

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[5]Leland L. Medsker, "Cooperative Action Among Two-Year and Four-Year Colleges: Opportunity and Obstacles", Educational Record, XXXIX (April, 1958), 117.

[6]Leland L. Medsker, The Junior College: Progress and Prospect (New York: McGraw-Hill Book Co., 1960), pp. 121-29.

native students.

A study by Beals at the University of Massachusetts in 1968 compared 239 community college transfers to 348 regularly enrolled students. The results showed a pattern of marked differences in grades in semester five to a similarity of grades in semester eight. The regularly enrolled students achieved a cumulative grade point average of 2.78 in the eighth semester, while the community college transfer averaged 2.62. The finding of no significant difference in the mean GPA in semester eight supported his hypothesis that the eighth semester grade point average would be approximately the same for both groups.[7]

While comparisons in general achievement are favorable, the achievement in selected areas of study remains largely unexplored for community college transfers.

Timing of Decision to Major in a Field of Study

The research in this field is not altogether conclusive regarding the relationship of academic achievement and the timing of a students' career choice. The Davis study indicated

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[7]Ernest W. Beals, "Academic Characteristics and Academic Success Patterns of Community College Transfer Students at the University of Massachusetts", (unpublished Ed.D. dissertation, University of Massachusetts, 1968), p. 112.

that students who later decide to switch their major to medicine, the humanities, or the social sciences tend to have higher academic performance than the original group of majors in those fields. Students who later switch to business administration were associated with lower academic performance than the original group of business majors.[8]

Sugarman in a study of freshmen at the State University of New York at Buffalo investigated the relationship between early commitment to a stated vocational choice and levels of academic achievement. In a comparison of vocationally undecided or uncommitted freshmen to the vocationally decided freshmen, the mean grade point average was found to be significantly lower among the decided students. The mean grade point average was also found to be significantly lower for the vocationally decided or committed students when they were compared to the tentatively decided or undecided students.[9]

In a study of students who had changed their major at Auburn University, Cook reported no significant difference between the grade point averages of changers and non-changers.

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[8]James A. Davis, Undergraduate Career Decisions (Chicago: Aldine Publishing Company, 1965), p. 49.

[9]Michael N. Sugarman, "Commitment to Stated Vocational Choice as a Factor in the Prediction of Academic Achievement among College Freshmen" (unpublished Ed.D. dissertation, State University of New York at Buffalo, 1966), cited in Dissertation Abstracts, XXVII (Ann Arbor, Michigan: University Microfilms, 1967), pp. 2900-2901.

While the students who had not changed their major from their entry into college had slightly better grade point averages, grades were not significantly affected by a change of majors later in college.[10]

The dissimilar results found by Sugarman and Cook seem to be accounted for by the differences in the groups used in the two studies. While Sugarman compared uncommitted freshmen to freshmen committed to a major field, Cook analyzed students who changed their major field to students who had not changed their major.

College Entrance Examination Board Scores

For the most part, the Scholastic Aptitude Test has been correlated with academic success in the freshman year of college. Studies by Fricke (1958), Mann (1961), Jeffreys (1962), Michael (1962), Watley and Martin (1962), Michael and Jones (1963), Brady (1965), Gallant (1965), Lins (1966), and O'Zee (1966) have found the SAT scores to be significant predictors of academic achievement for first-year students.

A study by Fisher at the University of Tennessee and a study by Yeremian at the University of Southern California found little relationship between the Scholastic Aptitude Test

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[10]M. Olin Cook, "College Students Change Majors", School and Society, May 1, 1965, p. 273.

and college achievement above the first year of college.[11] In a study of 799 students at the Georgia Institute of Technology, Willingham found preadmission information including the Scholastic Aptitude Test to be of no value in estimating sophomore academic performance. The predicted average using this information, only correlated .04 with the sophomore average.[12] Beals, in his study of community college transfers at the University of Massachusetts, also concluded that high school data including the Scholastic Aptitude Test were irrelevant in predicting success of transfer students in their last two years.[13]

Jacobson, on the other hand, found a high correlation between the Scholastic Aptitude Test scores and the senior grade point average. The scores correlated .45 with both

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[11]Everett J. Fisher, "A Longitudinal Study of the Prediction of Scholastic Success at the University of Tennessee" (unpublished Ph.D. dissertation, University of Tennessee, 1962), cited in Dissertation Abstracts, XXIII (Ann Arbor, Michigan: University Microfilms, 1963), p. 3465; Thais S. Yermian, "A Comparative Study of Divergent Thinking Ability and Academic Achievement of Students in the Honors Program at the University of Southern California" (unpublished Ed.D. dissertation, 1967), cited in Dissertation Abstracts, XXVII (Ann Arbor, Michigan: University Microfilms, 1967), p. 109.

[12]Warren W. Willingham, "Erroneous Assumptions in Predicting College Grades", Journal of Counseling Psychology, X (Winter, 1963), 390.

[13]Beals, "Academic Characteristics", p. 117.

the freshman and senior grade point average.[14]

The SAT Mathematical Test has been successfully correlated with college achievement in several areas. In a study at the University of Georgia, Irvine used the SAT Mathematical Test in a prediction equation for graduation. While the correlation with the criterion alone was low, the SAT Mathematical Test score did add a significant amount to the predictive power of the equation.[15] In a study at the University of Michigan, Mann and Fusfield studied instructors and students in an attempt to explain changes in student attitude sophistication in elementary economics. Part of the study involved SAT Verbal and Mathematical Test scores as independent variables in a multiple regression analysis using the course grade as the dependent variable. A strong positive correlation between the SAT Mathematical Test score and the course grade was found.[16]

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[14]Sol Jacobson, "Judicial Review of College Admission Policies", Journal of Higher Education, XXXIV (November, 1963), 436.

[15]Donald W. Irvine, "Multiple Prediction of College Graduation from Pre-Admission Data", Journal of Experimental Education, XXXV (Fall, 1966), 86.

[16]William R. Mann and Daniel R. Fusfield, "Attitude Sophistication and Effective Teaching in Economics", Journal of Economic Education, II (Spring, 1970), 123.

High School Average and Rank

Generally, the high school grade point average and high school rank have a greater predictive value than any other pre-college factor. Studies by Garrett (1949), Carlson and Milstein (1958), Fleischer (1961), Laughlin (1961), Giusti (1962), Endler and Steinberg (1963), Michael and Jones (1963), Long (1964), Brady (1965), Gallant (1965), Leaver (1965), Pabst (1965), Boone (1966), Flora (1966), O'Zee (1966), Himmel (1967), Mazak (1967), and Sachtleben (1967) have consistently correlated the high school grade point average or rank with the grade point average of the first year of college.

Several research studies have questioned the predictive ability beyond the freshman year of the high school average and high school rank. These studies suggest that the measurement of student aptitude and intellectual performance may change in college. In a study by Munger at the University of Toledo, high school rank could not distinguish graduates from non-graduates.[17] The Willingham study found high school information to be of no value in predictions beyond the first year.[18] A study by Humphreys at the University of Illinois

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[17]Paul F. Munger, "Can We Really Predict Who Will Graduate from College?", College and University, XXXII (Winter, 1957), 220.

[18]Willingham, "Erroneous Assumptions", p. 390.

reported a correlation of only .22 between high school rank and the eighth semester grade point average.[19] In the Jacobson study at Brooklyn College, the high school average correlated .50 with the freshman grade point average, but only correlated .20 with the four-year grade point average.[20]

There is also evidence that supports the use of high school grades in predictions beyond the first year of college. Scannell in a study at the University of Iowa and Iowa State College found a correlation of .59 between the high school average and the four-year grade point average.[21] In a study covering a five-year period at the University of Southern Mississippi, Lucy found the high school grade point average to be the most significant variable with a correlation of .62 to overall academic achievement.[22] High school rank had the highest correlation (.31) of the pre-admission variables used in the prediction of graduation at Trenton State College by Waller.[23] Garrett (1949), Jarvis (1953), Giusti (1964),

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[19]Lloyd G. Humphreys, "The Fleeting Nature of the Prediction of College Academic Success", Journal of Educational Psychology, LIX (October, 1968), 377.

[20]Jacobson, "Judicial Review", p. 436.

[21]Dale P. Scannell, "Prediction of College Success from Elementary and Secondary School Performance", Journal of Educational Psychology, LI (June, 1960), 134.

[22]Lucy, "A Study of Selected Factors", p. 109.

[23]Constance Waller, "Predicting Persistence to Graduation at Trenton State College" (unpublished Ed.D. dissertation, Columbia University, 1962), p. 73.

Coppedge (1966), and Irvine (1966) have also reported the high school grade point average and rank to be significant predictors over a four-year period.

High School Social Studies

Achievement in high school social studies has been useful in the prediction of later college achievement in a number of areas. In a study of collegiate academic success at the University of Wisconsin, Schroeder found the college social science grade point average to be the only variable that correlated highly with its high school complement.[24] A study by Brady of graduates from Classical High School, Springfield, Massachusetts, identified achievement in high school social studies as the second-best predictor of academic success in college. The high school social studies average correlated between .44 to .50 with the criterion, a two-year collegiate grade point average.[25] Giusti (1963), Schroeder (1963), Pabst (1965), and Lins (1966) have also related achieve-

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[24]Wayne L. Schroeder, "Factors Related to the Academic Success of Male College Students from Five Selected Wisconsin Counties", (unpublished Ph.D. dissertation, University of Wisconsin, 1963), cited in Dissertation Abstracts, XXIII (Ann Arbor, Michigan: University Microfilms, 1963), pp. 4207-208.

[25]William J. Brady, "Twenty Quantitative Predictors of Academic Success in College as Measured by Grade Point Averages", (unpublished Ph.D. dissertation, University of Connecticut, 1965), p. 107.

ment in high school social studies to achievement in the first year of college.

The number of units of social studies in high school has not been found significantly related to general college achievement. Sharp studied several variables and concluded, "The results of this study suggest that amount of study, measured in years which a student takes in a particular subject, has no significant effect or direct bearing upon the grade that a student makes in the first year of college..."[26] In the Irvine study, units of high school social study correlated .005 with college graduation.[27]

High School Mathematics

High school mathematics has been investigated by many researchers in an attempt to predict college success. A remarkable correlation (.58) between achievement in high school mathematics and first semester college grades was reported by McCormick and Asher.[28] Similar studies by

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[26]Bert. L. Sharp, "College Achievement: Its Relationship to High School Achievement Experiences and Test Scores", Personnel and Guidance Journal, XLI (November, 1962), 249.

[27]Irvine, "Multiple Prediction", p. 85.

[28]James H. McCormick and William Asher, "Aspects of the High School Record Related to the First Semester College Grade Point Average", Personnel and Guidance Journal, XLII (March, 1964), 701.

Zuckowsky (1961), Quiller (1962), Scott (1966), and Van Derslice (1968) have significantly related high school achievement in mathematics to selected fields in college and to general college achievement.

Brown and Abell reported two studies in which high school mathematics made a significant contribution to the prediction of success in college mathematics. The first study at the Tennessee Polytechnic Institute used the number of units in high school mathematics and grades in high school mathematics to predict success in college mathematics. The findings showed that the high school mathematics background was the most valuable information for predicting success in college mathematics.[29] The second study attempted to determine the relationship between high school and college mathematics grades for a group of students at St. Charles College in Louisiana. The study found that grades in college mathematics were approximately in the same range as high school grades despite a two-year period when no mathematics courses were taken by the group.[30]

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[29]Kenneth E. Brown and Theodore L. Abell, Analysis of Research in the Teaching of Mathematics, U. S. Department of Health, Education, and Welfare Bulletin, No. 28 (Washington, D. C.: U. S. Government Printing Office, 1965), p. 32.

[30]Ibid., p. 47.

The number of units of high school mathematics has been useful in the prediction of college success in several areas. Gallant and Greenwood have found the years of high school mathematics helpful in predicting first-year success in college.[31] In a study at the Michigan College of Mining and Technology, Baker investigated the relationship between success in college and the number of semesters in high school mathematics. He found the number of semesters of high school algebra to be an important indicator of success in college physics and chemistry.[32] Sachtleben, in a study of physics students, reported that the number of semesters of advanced high school mathematics was a significant predictor of success in college physics.[33]

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[31]Thomas F. Gallant, "Academic Achievement of College Freshmen and Its Relationship to Selected Aspects of the Student's Background" (unpublished Ed.D. dissertation, Western Reserve University, 1965), p. 77; Robert L. Greenwood, "The Prediction of Academic Success in the Technical Curricula of Community Colleges: An Investigation in the Chemical, Electrical, and Mechanical Curricula of Three Community Colleges in New York State" (unpublished Ph.D. dissertation, New York University, 1962), cited in Dissertation Abstracts, XXIII (Ann Arbor, Michigan: University Microfilms, 1963), pp. 898-899.

[32]Donald H. Baker, "A Study of the Relationships between Credit in Certain High School Mathematics and Science Courses and Various Aspects of Success at the Michigan College of Mining and Technology" (unpublished Ed.D. dissertation, Michigan State University, 1957), cited in Dissertation Abstracts, XVIII (Ann Arbor, Michigan: University Microfilms, 1957), pp. 877-78.

[33]Clyde C. Sachtleben, "An Analysis of Selected Background Variables which Affect Success in Physics in Liberal Arts Colleges" (unpublished Ph.D. dissertation, University of Iowa, 1967), p. 115.

GPA of the Freshman and Sophomore Years of College

The Freshman and Sophomore grade point average has been found to be the best predictor of future college achievement. This is the expected case since the freshman and sophomore GPA gauge achievement in the same environment as the criterion variable. Lewis reported previous semester achievement to be the most significant predictor of achievement in subsequent semesters.[34] Generally, the closer the predictor variable approaches the time and environment of the criterion variable, the higher the correlation coefficient. Lewis found the correlation between the junior and senior GPA to be as high as .745.[35] The Willingham study also found the highest correlation for future semesters to be previous semesters of college work.[36] Waller, in the prediction of graduation at Trenton State College, found the best single predictor to be the first semester grade point average in college.[37]

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[34]John W. Lewis, "Pre-College Variables as Predictors of Freshman, Sophomore, and Junior Achievement", Educational and Psychological Measurement, XXIV (Summer, 1964), 353-62.

[35]Ibid., p. 355.

[36]Willingham, "Erroneous Assumptions", p. 392.

[37]Waller, "Predicting Persistence", p. 73.

In a study of community college transfers at the University of Massachusetts, Beals found the grade point average earned in the first two years at the community college to the most revelant predictor of academic achievement at the University.[38] The highest correlation in the study was found with the "plugger-type" student. The "plugger-type" was defined as a student with SAT scores below 1000, but one who ranked in the top third of his high school class. The results appear below:[39]

Variable	1	2	3	4	Y*
1. Verbal SAT		.00378	-.12137	.27424	.23588
2. Math SAT			-.18206	-.3384	-.39769
3. Class Rank				.37042	.34700
4. C. C. GPA					.75855

*Y = UMass GPA

The results showed the best predictor, the community college GPA, far exceeded any other factor.

College Curriculum

The curriculum in college has been largely unexplored in comparison to other areas of prediction, but probably has the greatest potentiality for differential prediction in college subjects. This is the expected case since most

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[38]Beals, "Academic Characteristics", p. 117.

[39]Ibid., p. 77.

studies in the prediction of college achievement have found performance in the college curriculum to be correlated more with achievement in college than either biographical data or high school performance. The identification of the aptitude needed for college economics could begin with the correlation of selected subjects to achievement in economics. This has been done successfully in several studies in other fields.

Kinzer and Kinzer studied a group of engineering students at Ohio State University in an attempt to predict achievement in the advanced mathematics courses in the engineering curriculum. The independent variables in the study were the percentile scores in the Ohio State Psychological Examination and an average grade for all the engineering prerequisites in advanced mathematics. The basic mathematics courses were significant predictors of success in the advanced mathematics courses with multiple correlation coefficients ranging from .63 to .89.[40]

In a study of 156 physics students at Oklahoma State University, Woodward attempted to predict achievement in the first course in college physics. He investigated the relationship between the following variables and achievement in physics: high school science achievement, high school

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[40]John R. Kinzer and Linda G. Kinzer, "Some Bases for Predicting Marks in Advanced Engineering Mathematics", Educational Research Bulletin, XXXIII (January, 1954), 13-18.

English achievement, high school mathematical achievement, the high school GPA, achievement in college mathematics, achievement in college chemistry, the GPA for all college work, and scores in several standardized tests. The best predictors for success in college physics were the GPA for all college work and the average grade in college mathematics.[41]

Peterson studied the relationship of selected factors from the personnel records of students in introductory accounting at the University of Minnesota in an attempt to predict the success or failure of future students. A total of thirty-three factors were used, including grade averages, the Strong Vocational Interest Blank, and the Minnesota Multiphasic Personality Inventory. The best predictors of achievement in accounting were the grade point averages. The three best predictors were the overall grade point average with a correlation of .49, grades in economics with a correlation of .43, and grades in mathematics with a correlation of .39. He reported in his summary that, "The common practice in colleges of using courses in economics as selector

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[41]Carl S. Woodward, "Factors in a Student's Cumulative Scholastic Record which Predict Achievement in a First Course in College Physics" (unpublished Ed.D. dissertation, Oklahoma State University, 1962), cited in Dissertation Abstracts, XXIII (Ann Arbor, Michigan: University Microfilms, 1963), p. 337.

courses for enrollment in accounting was supported in this study."[42]

The number of credits in selected college courses may be more meaningful in differential prediction than in general prediction of college achievement. While the number of credits in selected subjects has not been very useful in most general prediction studies, there has been some success in prediction involving one subject area. In a study of physics students, Sachtleben attempted to predict success in the introductory college physics course from selected factors which included the semester hours of several college courses. He found the semester hours of freshman mathematics to be a significant predictor of college physics.[43]

Interest and Vocational Plans

Interest scales and other measures of interest have been used in predictive studies with varying degrees of success. A recent study by Shappell, Arnold, and Gregory again confirmed earlier conclusions that students have significant measurable interests related to their major area of

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[42]Charles A. Peterson, "The Prediction of Students' Success in College Accounting", (unpublished Ph.D. dissertation, University of Minnesota, 1966), pp. 70-91.

[43]Sachtleben, "Success in Physics", p. 115.

concentration.[44] The measurement of these interests may be particularly useful in the counseling of economics majors. A study by French attempted to measure the interest and satisfaction of college seniors in their major field of study. The study found social science majors the least satisfied with their major field of study; economics and sociology students seemed to be the most disappointed with their major. The correlation of the degree of satisfaction with the grade point average in their major, however, was not significant.[45]

Several studies have been successful in the correlation of academic achievement to measures of academic interest. A study by French attempted to predict junior and senior grade point averages from aptitude factors, interest measures, and personality scales. The findings suggested that interest measures did contribute to differential prediction.[46] Levine studied a group of 129 undergraduate science-teaching and English majors at Jersey City State College to determine the

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[44]Dean L. Shappell, Frank C. Arnold, and Wibur S. Gregory, "Differentiation of Academic Interests", Educational and Psychological Measurement", XXIX (Summer, 1969), 478.

[45]John W. French, "Aptitude and Interest Score Patterns Related to Satisfaction with College Major Field", Educational and Psychological Measurement, XXI (Summer, 1961), 287-94.

[46]John W. French, "Comparative Prediction of College Major-Field Grades by Pure-Factor Aptitude, Interest, and Personality Measures", Educational and Psychological Measurement, XXIII (Winter, 1963), 767-74.

factors that influence their selection of an area of specialization. He found a high correlation between the grade achievement in a subject and interest in that subject.[47] In a study of freshmen at the University of Pittsburgh, Martin developed an interest scale to be used with the Strong Vocational Interest Blank. The instrument identified consistent and significant differences in interests between "underachieving" and "overachieving" freshman students.[48] Studies by Taylor, Lezotte, and Bondy at Ferris State College and Walker at Indiana University have also found the Strong Vocational Interest Blank to be of some use in predicting academic success.[49]

There has been a substantial amount of research that

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[47]Benjamin Levine, "Characteristics of Prospective Science Teachers as Compared with Those of Prospective English Teachers" (unpublished Ed.D. dissertation, Columbia University, 1964), cited in Dissertation Abstracts, XXV (Ann Arbor, Michigan: University Microfilms, 1965), p. 2069.

[48]Ann M. Martin, "The Development and Successive Refinement of An Academic Interest Scale for the Strong Vocational Interest Blank", Educational and Psychological Measurement, XXIV (Winter, 1964), 841-52.

[49]Ronald G. Taylor, Lawrence Lezotte, and Stephen B. Bondy, "Interest Patterns of Successful and Nonsuccessful Male Collegiate Technical Students", Journal of Educational Research, LX (May, 1967), 402; Thomas H. Walker, "An Analysis of Ten Strong Vocational Interest Blank Scores as Related to Choice of College Curricula and Scholastic Success at Indiana University" (unpublished Ed.D. dissertation, Indiana University, 1965), cited in Dissertation Abstracts, XXVI (Ann Arbor, Michigan: University Microfilms, 1966), p. 5255.

has found little predictive validity in most of the approaches used in the measurement of interest. A recent study by Lindsay and Althouse at Pennsylvania State University has found the Strong Vocational Interest Blank to be of no practical use in the prediction of academic achievement.[50] On the whole, most research does indicate that interest measurement has not been significantly correlated to academic achievement. Studies by Stone (1958), England (1960), Jones (1961), DeSena (1964), Miller (1964), Smith (1967), Lewis (1966), and Tamir (1968) have concluded that interest measurement has little use in the prediction of academic success.

The correlation of vocational plans and academic achievement has not been settled conclusively. The question yet unanswered is the effect of vocational plans upon motivation and academic achievement. Davis found students in premedical curriculums to have a tendency toward greater improvement in grades than students in less vocationally oriented fields.[51] Anastasi, in a study at Fordham, found plans for

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[50]Carl A. Lindsay and Richard Althouse, "Comparative Validities of the Strong Vocational Interest Blank Academic Achievement Scale and the College Student Questionnaire Motivation for Grades Scale", Educational and Psychological Measurement, XXIX (Summer, 1969), 492.

[51]Davis, Career Decisions, p. 49.

post-baccalaureate study related to grades.[52] On the other hand, Lunneborg and Lunneborg found plans for graduate study to have no relation to grades at the University of Washington.[53] In a study of mathematics students at the University of North Carolina, Graybeal found vocational interest to have a minor or non-existent role in predicting academic achievement.[54]

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[52]Anne Anastasi, Martin J. Meade, and Alexander A. Schneiders, The Validation of a Biographical Inventory as a Predictor of College Success (New York: College Entrance Examination Board, 1960), p. 39.

[53]Patricia W. Lunneborg and Clifford E. Lunneborg, "The Differential Prediction of College Grades from Biographic Information", Educational and Psychological Measurement, XXVI (Winter, 1966), 925.

[54]Walter T. Graybeal, "Predictive Factors Associated with Achievement and Success in College Algebra" (unpublished Ph.D. dissertation, University of North Carolina, 1958), cited in Dissertation Abstracts, XIX (Ann Arbor, Michigan: University Microfilms, 1959), p. 2534.

Summary and Conclusions

1. Academic factors seem to be more useful than non-intellective factors in the prediction of grades.

2. In differential predictions at the college level, college variables appear to be more predictive than variables obtained from pre-admission data.

3. Previous academic achievement is often more useful than test instruments in the prediction of academic success.

4. There needs to be more study to determine whether factors that predict general academic achievement are useful in the prediction of academic achievement in economics.

C H A P T E R III

PROCEDURES AND TREATMENT OF THE DATA

This chapter will be concerned with the description of the sample and the preliminary statistical procedures used in analyzing the data.

Description of the Sample

The study involved Bachelor of Arts degree candidates in economics, class of 1970, at the University of Massachusetts. The sample included all students who entered the university as majors in economics in 1966, students who subsequently decided to major in economics, students who later changed their major to economics, and students who failed to graduate in earlier classes and had become part of the class of 1970. The total population of this group included ninety-seven students. The sample used in the analysis, however, involved ninety-two students since complete records were not available for five students.

The sample was limited to the University of Massachusetts in order to increase the precision of prediction which is possible only when students from one university are used as the sample. Research by Brown and Dubois has indicated that a homogeneous group of students make the best subjects

in predictive studies.[1] The use of a sample at one university increases the accuracy of the prediction at that institution by eliminating the variance contributed by heterogeneous institutional arrangements and by factors that may be impractical to identify or measure.

Seniors were selected so that achievement in economics would span at least three semesters of college work in economics which involve approximately eighteen or more semester hours of upper-division courses in economics. Seniors, since they were still present on the campus, provided the assessibility desirable in the measurement of attitudes toward their undergraduate economics program and future career.

Description of the Setting

The University of Massachusetts

The University of Massachusetts is a large state university enrolling 18,000 students in programs which include the divisions of the College of Agriculture, the College of Arts and Sciences, the Schools of Business Administration, Education, Engineering, Home Economics, Nursing, and Physical Education. The main campus, encompassing 1,100 acres at Amherst also houses bureaus and centers engaged in

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[1]Frederick G. Brown and Thomas E. Dubois, "Correlates of Academic Success for High-Ability Freshman Men", Personnel and Guidance Journal, XLII (February, 1964), 603-607.

research and public service in the fields of agriculture, computer science, education, government research, labor relations, natural resources, and population.

The student body, like many of the land-grant state universities, is predominantly composed of in-state students. The main campus is primarily a residence college where the majority of students live in dormitories or in near-by apartments. In recent years, an increasing percentage of students have spent their freshman and sophomore years at the branch of the university at Boston or in one of the state community colleges. However, in a review of college bulletins, the basic program followed in the first two years by the regular four-year student, the branch student, and the community college student are very similar in the curriculum content.

The Undergraduate Program in Economics

The Department of Economics, located in the College of Arts and Sciences, offers a comprehensive curriculum in economics for undergraduate students. The curriculum offers a great deal of flexibility for students who choose to major in economics. In their freshman and sophomore year, economics majors are required to take a sequence of two introductory courses in economics, Elements of Economics and Problems of the National Economy, as prerequisites to all the advanced courses in economics. The only requirements in the upper-division curriculum involve two courses in theory, Inter-

mediate Microeconomic Theory and Macroeconomic Theory and Business Cycles. The student is then free to elect an additional twelve credits from the economics curriculum offerings (see Appendix A).

The department had also required economics majors to complete a course in statistics and accounting in the program under which the students in the sample entered the university in 1966. Beginning with the class of 1970, the requirement was changed to two semesters of mathematics.

Selection of the Variables

In the analysis of the factors related to achievement in economics, it was essential to make some preliminary selection of variables that would offer the most promise of being useful in a multiple regression equation. It was necessary to set up guidelines for the selection of variables, since it would be impossible and of little use to consider all the background variables. The guidelines used in the selection of the variables in the study are listed below:

1. The variables selected should include variables that have been useful in other studies of college academic achievement.
2. The variable should show some promise of being related to academic achievement in economics.
3. The variable must be available for consideration prior to the junior year in college.

4. The variable must have the ability of being expressed in a numerical form.
5. The variable must be available for the majority of students.

A certain amount of flexibility and personal judgment had to be used in applying these guidelines, especially in the case of the first two statements. In the first guideline, variables were selected that had been important in the prediction of general college achievement and in some differential predictive studies. The variables selected to be related to achievement in economics were those that had been related to collegiate academic achievement and variables from those areas such as mathematics and the social sciences that are generally considered to be related to economics.

Collection of the Data

The Scholastic Aptitude Test, the high school record, and the college record were obtained from the Department of Economics and the Office of the Registrar. Permission to obtain data from student records was granted by the Dean of Admissions and Records, the Registrar, and the Chairman of the Department of Economics with the stipulation that steps would be taken to keep all the information strictly confidential. Therefore, all names from the student records were concealed by the use of a numerical code. The Office of the

Registrar and the Department of Economics provided the complete records for 94.8 per cent of the students who majored in economics in the class of 1970 at the University of Massachusetts.

Data on interest in economics and the career intentions of the students in the sample were collected from a questionnaire developed by the writer. The description of the procedures followed in the testing and administration of this instrument will be found in Chapter V.

Description of the Variables

The following section describes the quantification of each variable from student records. Extensive use of a calculator was necessary since over 4,000 individual computations were needed in this preliminary treatment of the data. Tables in this section are used to indicate the range and dimensions of each variable after all the preliminary calculations were made for the students in the study.

Criterion

The criterion variable used in the study was a grade point average for all the upper-division courses in economics. The GPA in economics covered a three-semester period (5th, 6th, and 7th semesters). The method of calculating grade point averages is given in Table 1. Table 2 shows the

relative spread of the grade point averages in economics. Table 3 indicates the spread of the cumulative grade point averages after seven semesters of study for the students in the sample.

TABLE 1

METHOD OF CALCULATING COLLEGE GRADE POINT AVERAGES

Course Number	Semester Hrs. of Credit	Course Grade	Quality Points Per Semester Hr.	Total Quality Points Per Course
I	3	A	4	12
II	3	B	3	9
III	4	C	2	8
IV	2	D	1	2
V	3	F	0	0
Total	15			31

Grade Point Average = 31/15 = 2.07

TABLE 2

DISTRIBUTION OF GRADE POINT
AVERAGES IN ECONOMICS
(In Numbers and Percentages of Students, N=92)

GPA in Economics	Number	Percentage
Below 2.00	15	16.3
2.00 to 2.49 . . .	26	28.3
2.50 to 2.99 . . .	20	21.7
3.00 to 3.49 . . .	21	22.8
3.50 and above . . .	10	10.9

Mean = 2.579
Standard Deviation = .641

TABLE 3

DISTRIBUTION OF CUMULATIVE GRADE POINT
AVERAGES AFTER SEVEN SEMESTERS
(In Numbers and Percentages of Students, N=92)

Cumulative GPA	Number	Percentage
Below 2.00 . . .	17	18.4
2.00 to 2.49. . .	32	34.8
2.50 to 2.99. . .	32	34.8
3.00 to 3.49. . .	10	10.9
3.50 and above . .	1	1.1

Mean = 2.427
Standard Deviation = .464

Age of the Student

The age of a student on March 30, 1970, was used as a variable in the study. However, students who would have had a birthday within two months of that date were put into the next age bracket. Table 4 indicates a relative homogeneity of age for the sample under investigation.

TABLE 4

AGE OF THE SAMPLE IN THEIR SENIOR YEAR
(In Numbers and Percentages of Students, N=92)

Age	Number	Percentage
Below 21	1	1.1
21 and 22	81	88.1
23 and 24	5	5.4
24 and above	5	5.4

Mean = 21.79
Standard Deviation = 1.36

Sex of the Student

The sex of the student was quantified for the regression analysis by assigning one (1) for males and two (2) for females. Table 5 reveals the vast majority of students in the sample were males.

TABLE 5

SEX OF THE STUDENTS IN THE STUDY
(In Numbers and Percentages of Students, N=92)

Sex	Number	Percentage
(1) Male	84	91.3
(2) Female. . . .	8	8.7

Community College Attendance

The attendance of some students at state-supported community colleges in the freshman and sophomore years was the second dichotomous variable. Quantification was accomplished by the assignment of one (1) for the regular university student and two (2) for the community college transfer. The division of students according to place of attendance in the first two years of college is reported in Table 6.

TABLE 6

COMMUNITY COLLEGE STUDENTS IN THE STUDY
(In Numbers and Percentages of Students, N=92)

Group	Number	Percentage
(1) Regular university students . . .	80	87.0
(2) Community college transfers . . .	12	13.0

Timing of the Decision to Major in Economics

The quantification of this variable was accomplished by assigning the numerals one (1) through eight (8) to indicate which semester the student decided to major in economics. The information from college transcripts indicated a great deal of indefiniteness in the choice of a major field of study. The majority of students had majored in another area of study before switching to economics. Data in Table 7 indicate that seventy-five per cent of the students had majored in at least one other area. Table 8 shows the semester a student first registered as an economics major.

TABLE 7

STABILITY IN THE SELECTION OF A MAJOR FIELD OF STUDY
(In Numbers and Percentages of Students, N=92)

Group	Number	Percentage	Total No. in Sample
Students who had chosen economics only	20	24.7	81[a]
Students who had majored in at least one other area	61	75.3	81

[a]Eleven transfer students were not included since their transcripts did not indicate a major field of study in their freshman and sophomore year.

TABLE 8

FIRST REPORTED SEMESTER OF DECISION
TO MAJOR IN ECONOMICS
(In Numbers and Percentages of Students, N=92)

Semester of Decision	Number	Percentage
First semester	20	21.7
Second semester	10	10.9
Third semester	11	12.0
Fourth semester	21	22.8
Fifth semester	15	16.3
Sixth semester	5	5.4
Seventh or later semester . .	10	10.9

Mean = 3.652
Standard Deviation = 2.030

College Entrance Examination Board Scores

The Verbal and Mathematical Scholastic Aptitude Test were both used as variables in the study. The scores of students who had taken the College Boards only one time were used exactly as recorded in their files. However, multiple scores from students who had taken the College Boards more than one time were adjusted according to the following standard procedure:[2]

2 junior scores = $\frac{\text{jr. SAT \& jr. SAT}}{2}$

1 junior, 1 senior score = $\frac{\text{jr. SAT \& 2 (sr. SAT)}}{3}$

2 senior scores = $\frac{\text{sr. SAT \& sr. SAT}}{2}$ -5

2 junior, 1 senior score = Drop 1st jr., $\frac{\text{2nd jr. SAT \& 2 (sr. SAT)}}{3}$ -10

1 junior, 2 senior scores = Drop jr., $\frac{\text{sr. SAT \& sr. SAT}}{2}$ -10

3 senior scores = $\frac{\text{sr. SAT \& sr. SAT \& sr. SAT}}{3}$ -10

2 junior, 2 senior scores = Drop both jr., $\frac{\text{sr. SAT \& sr. SAT}}{2}$ -10

1 junior, 3 senior scores = Drop jr., $\frac{\text{sr. SAT \& sr. SAT \& sr. SAT}}{3}$ -10

2 junior, 3 senior scores = Drop both jr., $\frac{\text{sr. SAT \& sr. SAT \& sr. SAT}}{3}$ -10

Table 9 and 10 indicate the range of scores on the SAT Verbal and Mathematical Test for the students under

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[2]William Starkweather, An Admissions Data Processing System (Amherst: Office of Institutional Studies, University of Massachusetts, 1964), p. 34.

investigation.

TABLE 9

DISTRIBUTION OF SAT VERBAL SCORES
(In Numbers and Percentages of Students, N=92)

SAT Verbal Scores	Number	Percentage
Below 400	2	2.2
400 to 499	37	40.2
500 to 599	45	48.9
600 and above	8	8.9

Mean = 521.55
Standard Deviation = 66.76

TABLE 10

DISTRIBUTION OF SAT MATHEMATICAL SCORES
(In Numbers and Percentages of Students, N=92)

SAT Math. Scores	Number	Percentage
Below 400	..	..
400 to 499	9	9.8
500 to 599	42	45.6
600 and above	41	44.6

Mean = 585.86
Standard Deviation = 68.57

High School Grade Point Average

The high school grade point average was converted to the same scale that was employed in finding college grade point averages. All final high school grades were converted to a GPA by the same method used in Table 1. When high schools recorded grades according to a numerical system, the following procedure for conversion was employed: (1) 90-100 = A, (2) 80-89 = B, (3) 70-79 = C, (4) 60-69 = D, and (5) below 60 = F. Data in Table 11 indicate the majority of students had a 2.50 or better high school GPA.

TABLE 11

DISTRIBUTION OF HIGH SCHOOL GRADE POINT AVERAGES
(In Numbers and Percentages of Students, N=92)

High School GPA	Number	Percentage
Below 2.00	3	3.3
2.00 to 2.49	12	13.0
2.50 to 2.99	46	50.0
3.00 to 3.49	25	27.2
3.50 and above	6	6.5

Mean = 2.823
Standard Deviation = .429

High School Rank

Data on high school rank were in the form of class size and the numerical standing of the student in the class. In order to use the rank in a regression analysis and to provide an adjustment for various sized classes, the following formula was used to convert the data to a standard score.[3]

$$\frac{\text{Rank in class} - .5}{\text{Size of class}} = \text{Inverted Percentile Rank}$$

The Inverted Percentile Rank was then converted to a standard score by the following method:

Inverted Percentile Rank	Converted Rank
.0000 - .0016	80
.0017 - .0022	79
.0023 - .0030	78
.0031 - .0040	77
.0041 - .0054	76
.0055 - .0071	75
.0072 - .0094	74
.0095 - .0122	73
.0123 - .0158	72
.0159 - .0202	71
.0203 - .0256	70
.0257 - .0322	69
.0323 - .0401	68
.0402 - .0495	67
.0496 - .0606	66
.. ..	..
.9929 - .9945	25
.9946 - .9959	24
.9960 - .9969	23
.9970 - .9977	22
.9978 - .9983	21
.9984 -1.0000	20

[3]Starkweather, Data Processing, p. 35.

The spread of the high school rank accorded to the converted scale is illustrated in Table 12.

TABLE 12

DISTRIBUTION OF THE CONVERTED HIGH SCHOOL RANK
(In Numbers and Percentages of Students, N=92)

Converted Rank	Number	Percentage
Below 40	3	3.3
40 to 49	5	5.4
50 to 59	47	51.1
60 to 69	32	34.8
70 and above	5	5.4

Mean = 58.18
Standard Deviation = 6.57

Achievement in Social Studies in High School

Achievement in the social studies was quantified by computing the grade point average of all the subjects in the social studies area. Subjects such as problems of democracy, history, economics, etc. were included in the social studies area. The students under investigation did slightly better in the social studies area than in the other areas under study (see Tables 13, 11, and 15).

TABLE 13

DISTRIBUTION OF GRADE POINT AVERAGES IN HIGH SCHOOL SOCIAL STUDIES
(In Numbers and Percentages of Students, N=92)

Social Studies GPA	Number	Percentage
Below 2.00	5	5.4
2.00 to 2.49	7	7.6
2.50 to 2.99	19	20.7
3.00 to 3.49	44	47.8
3.50 and above	17	18.5

Mean = 2.968
Standard Deviation = .622

Units of Social Studies in High School

The number of units in high school social studies was quantified by assigning the appropriate numeral for the actual number of units taken by the student (see Table 14). The analysis of this data found the social studies area to be the most limited area for the students in their high school curriculum. For example, the number of units averaged to 2.88 in the social studies, while the number of units in foreign language averaged to 4.17. Forty-one per cent of the students had been exposed only to history in the social studies area. Eighty-nine per cent of the sample had not taken economics in high school.

TABLE 14

UNITS OF SOCIAL STUDIES IN HIGH SCHOOL
(In Numbers and Percentages of Students, N=92)

Units of Social Studies	Number	Percentage
None	3	3.3
One unit	4	4.3
Two units	23	25.0
Three units	39	42.4
Four units	20	21.7
Five units	3	3.3

Mean = 2.88
Standard Deviation = 1.04

Achievement in Mathematics in High School

Achievement in mathematics in high school was calculated by the use of a grade point average for all the subjects in the mathematics area. Courses in algebra and geometry dominated the high school mathematics group although in some instances, calculus and trigonometry were taken by the students. Data on the high school mathematics GPA are described in Table 15.

TABLE 15

DISTRIBUTION OF GRADE POINT AVERAGES
IN HIGH SCHOOL MATHEMATICS
(In Numbers and Percentages of Students, N=92)

GPA in High School Math.	Number	Percentage
Below 2.00	5	5.4
2.00 to 2.49	13	14.2
2.50 to 2.99	24	26.1
3.00 to 3.49	32	34.8
3.50 and above	18	19.5

Mean = 2.889
Standard Deviation = .558

Units of Mathematics in High School

The units of mathematics in high school were quantified by using the numerical equivalent of the actual number of units taken in mathematics. Table 16 indicates that almost eighty per cent of the students had four units of mathematics in high school.

TABLE 16

UNITS OF MATHEMATICS IN HIGH SCHOOL
(In Numbers and Percentages of Students, N=92)

Units of Mathematics	Number	Percentage
Two units or less	..	..
Three units	9	9.8
Four units	72	78.3
Five units	11	11.9
Mean = 4.02 Standard Deviation = .47		

Freshman and Sophomore GPA

The freshman and sophomore grade point average was calculated from the transcripts of the first four semesters in college. Non-credit courses were not used in the computation of the grade point average. However, courses and credits transferred from other colleges and universities were used in the computation of the freshman and sophomore GPA. Table 17 reveals a wide dispersion of grade point averages in first two years of college.

TABLE 17

DISTRIBUTION OF FRESHMAN AND SOPHOMORE GRADE POINT AVERAGES
(In Numbers and Percentages of Students, N=92)

F & S GPA	Number	Percentage
Below 2.00	20	21.7
2.00 to 2.49	39	42.4
2.50 to 2.99	20	21.7
3.00 to 3.49	11	12.0
3.50 and above	2	2.2

Mean = 2.360
Standard Deviation = .492

Achievement in Elementary Economics

Achievement in elementary economics was computed by averaging the two course grades received in the two semesters of the elementary course. Students did better in elementary economics (see Table 18) than in their freshman and sophomore average (see Table 17), their social science average (see Table 19), or their mathematics average (see Table 23).

TABLE 18

GRADE AVERAGES IN ELEMENTARY ECONOMICS
(In Numbers and Percentages of Students, N=92)

Average Grade	Number	Percentage
Below 2.00	7	7.6
2.00	13	14.1
2.50	19	20.7
3.00	23	25.0
3.50	21	22.8
4.00	9	9.8

Mean = 2.850
Standard Deviation = .721

Achievement in the Social Sciences

Achievement in the social sciences was quantified by the calculation of the grade point average for the courses in the social sciences taken in the first four semesters of college. Elementary economics was not included in the group since it was used separately as a variable. Courses in anthropology, government, history, and sociology were used in the computation of the GPA. Table 19 denotes the GPA range in the social sciences for the first four semesters of college. Table 20, as a comparison, shows the GPA in the social sciences after seven semesters of college work. The former set of data, however, was used in the prediction equation.

TABLE 19

DISTRIBUTION OF GRADE POINT AVERAGES IN THE SOCIAL SCIENCES IN THE FRESHMAN AND SOPHOMORE YEAR
(In Numbers and Percentages of Students, N=92)

Social Science GPA	Number	Percentage
Below 2.00	15	16.3
2.00 to 2.49	37	40.2
2.50 to 2.99	18	19.6
3.00 to 3.49	16	17.4
3.50 and above	6	6.5

Mean = 2.383
Standard Deviation = .636

TABLE 20

DISTRIBUTION OF GRADE POINT AVERAGES
IN THE SOCIAL SCIENCES AFTER
SEVEN SEMESTERS
(In Numbers and Percentages of Students, N=92)

Social Science GPA	Number	Percentage
Below 2.00	9	9.8
2.00 to 2.49	31	33.7
2.50 to 2.99	28	30.4
3.00 to 3.49	19	20.7
3.50 and above	5	5.4

Mean = 2.506
Standard Deviation = .596

Semester Hours in the Social Sciences

The semester hours in the social sciences were calculated by totaling the semester hours, successfully completed by the student, in the social sciences in the first four semesters of college. The same courses outlined in the last section were used in this analysis. Table 21 describes the semester hours of social sciences in the first four semesters of college work. As a follow-up, Table 22 reveals the extent of work in the social science area, excluding economics, after seven semesters of study.

TABLE 21

SEMESTER HOURS IN THE SOCIAL SCIENCES
IN THE FRESHMAN AND SOPHOMORE YEAR
(In Numbers and Percentages of Students, N=92)

Semester Hours	Number	Percentage
None	4	4.3
3 sem. hrs.	8	8.7
6 sem. hrs.	20	21.8
9 sem. hrs.	32	34.8
12 sem. hrs. or more	28	30.4

Mean = 8.71
Standard Deviation = 3.98

TABLE 22

SEMESTER HOURS IN THE SOCIAL SCIENCES
AFTER SEVEN SEMESTERS
(In Numbers and Percentages of Students, N=92)

Semester Hours	Number	Percentage
3 to 6 sem. hrs.	5	5.4
9 to 12 sem. hrs.	32	34.8
15 to 18 sem. hrs.	34	37.0
21 to 24 sem. hrs.	16	17.4
24 or more sem. hrs.	5	5.4

Mean = 15.61
Standard Deviation = 6.38

Achievement in Mathematics

Achievement in mathematics was quantified by the computation of a grade point average for courses taken in the mathematics area in the first four semesters of college. All courses taken in mathematics and statistics were included in the calculation of the GPA. Table 23 shows the range of the mathematics grade point averages used in the study. The follow-up study (see Table 24), after seven semesters of college work, shows a relative stability of academic achievement for the sample. This can largely be explained by the fact that most of the course work in mathematics was taken in the first four semesters of college.

TABLE 23

DISTRIBUTION OF GRADE POINT AVERAGES
IN MATHEMATICS IN THE FRESHMAN
AND SOPHOMORE YEAR
(In Numbers and Percentages of Students, N=92)

GPA in Mathematics	Number	Percentage
Below 2.00	28	30.4
2.00 to 2.49	25	27.2
2.50 to 2.99	13	14.1
3.00 to 3.49	16	17.4
3.50 and above	10	10.9

Mean = 2.216
Standard Deviation = .863

TABLE 24

DISTRIBUTION OF GRADE POINT AVERAGES IN MATHEMATICS AFTER SEVEN SEMESTERS
(In Numbers and Percentages of Students, N=92)

GPA in Mathematics	Number	Percentage
Below 2.00	27	29.4
2.00 to 2.49	30	32.6
2.50 to 2.99	14	15.2
3.00 to 3.49	12	13.0
3.50 and above	9	9.8

Mean = 2.213
Standard Deviation = .880

Semester Hours of Mathematics

The semester hours in mathematics were calculated by using the total semester hours of mathematics, successfully completed, in the first four semesters of college. Most students, as indicated in Table 25, had taken six to nine hours of course work in mathematics in their freshman and sophomore year. Table 26 shows a small increase in the semester hours of mathematics when seven semesters of college work are included in the investigation.

TABLE 25

SEMESTER HOURS OF MATHEMATICS IN
THE FRESHMAN AND SOPHOMORE YEAR
(In Numbers and Percentages of Students, N=92)

Semester Hours	Number	Percentage
3 sem. hrs.	9	9.8
6 sem. hrs.	35	38.0
9 sem. hrs.	33	35.9
12 sem. hrs. or more . . .	15	16.3

Mean = 7.88
Standard Deviation = 2.94

TABLE 26

SEMESTER HOURS OF MATHEMATICS AFTER
SEVEN SEMESTERS
(In Numbers and Percentages of Students, N=92)

Semester Hours	Number	Percentage
3 sem. hrs.	2	2.2
6 sem. hrs.	15	16.3
9 sem. hrs.	39	42.4
12 sem. hrs.	24	26.1
15 sem. hrs. or more . . .	12	13.0

Mean = 10.07
Standard Deviation = 3.11

Interest and Career Intentions

Since the review of research found little success in the utilization of measures of interest and vocational plans in the prediction of academic success, it was decided that these measures would probably add little to the present predictive equation. It seemed worthwhile, however, to investigate the attitudes of students in the sample in order to better understand their relationship to achievement in the undergraduate economics curriculum. This investigation would also explore the potential for interest and career attitude measurement as a tool in the counseling of economics majors. Consequently, the interest and career variables were not used in the prediction equation, but each was used in a correlational analysis to academic achievement in economics.

A questionnaire, designed and tested by the writer, was administered to the sample in their senior year for the collection of data regarding the attitudes toward interest in economics, satisfaction with the choice of economics as a major field, and future career plans. Chapter V explains the design, testing, and results of the questionnaire.

Preparation for the Computer

The next step after making the preliminary calculations of the variables on work sheets involved the transfer of the data onto IBM cards. The preliminary 2300 calculations were

keypunched personally by the writer onto 350 IBM cards in the first operation. This number represented the calculations for the first eighteen predictors and the calculations for the follow-up variables after seven semesters (the cumulative GPA, GPA in the social sciences and mathematics, and the total semester hours in the social sciences and mathematics). A second keypunching of 1625 calculations onto 250 IBM cards was necessary in the correlational analysis of the data from the questionnaire. Seventy-eight per cent of the questionnaires were gathered in the study, but it was still necessary to keypunch all the data again to fit the smaller sample size. Each card was then checked to insure accuracy.

C H A P T E R IV

ANALYSIS OF THE MULTIPLE REGRESSION DATA

This chapter describes the relationships between the independent variables and the dependent variable, the computation and interpretation of multiple regression analysis, and the analysis of the prediction equations developed in the study.

Statistical Methods

After the data cards were keypunched, the data were submitted to the Research Computing Center at the University of Massachusetts with a regression analysis program written by Dr. M. King Deets of the General Business and Finance Department. The output of this program included the correlation coefficients, regression coefficients, T values for the slope, standard deviation of the regression coefficients, standard error of estimate, the F test value, and the multiple R and R^2. This program provided the data for all aspects of the analysis used in this chapter except for the simplification of the prediction equation.

Correlational Analysis

One of the problems in the study was to discover the relationship between the selected factors and academic

achievement in economics. In studies of this nature, the coefficient of correlation is the statistical technique utilized to establish the degree of relationship between the independent variables and the dependent variable. The coefficient of correlation indicates how closely two variables are related; it reveals to what extent variations in one variable are associated with variations in the other.[1] The correlation coefficient does not indicate a cause and effect relationship, but measures the "degree of association". Either one of the variables may be the cause of the other or the co-variation could be due to a common cause which affects both variables in the same way, or in opposite ways.[2]

The following formula was used for the coefficients of correlation:[3]

$$r_{12} = \frac{\Sigma x_1 x_2}{\sqrt{(\Sigma x_1^2)(\Sigma x_2^2)}}$$

where x_1 is the dependent variable and x_2 is the independent variable.

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[1]J. P. Guilford, Fundamental Statistics in Psychology and Education (New York: McGraw-Hill Book Co., Inc., 1956), p. 135.

[2]Frederick E. Croxton and Dudley J. Cowden, Practical Business Statistics (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1960), p. 394.

[3]Ibid., p. 413.

The size of the correlation coefficient (r) in this study indicated the degree of relationship between the independent variables and the dependent variable, the GPA in economics. The interpretation of correlation coefficients has been the subject of discussion in studies of prediction for many years. In an analysis of correlation coefficients, a rough estimate of the value of a coefficient was developed by Schrader.[4]

Coefficient	Interpretation
.60 or above	Excellent but seldom obtained
.45 - .59	Satisfactory
.24 - .44	Possibly useful in a predictive team
.00 - .24	Of doubtful value

In order to determine the significance of the correlation coefficient in a particular study, a test of significance is utilized to see if the coefficients could have occurred by chance. If a correlation is significant, the coefficient is too large to be attributed to a sampling error. The t test for correlation coefficients used in this

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[4]William B. Schrader, "Making Test Scores Meaningful", The College Board Review, XIV (1951), 205.

study is given below:[5]

$$t = r\sqrt{\frac{n-2}{1-r^2}}$$

where r is the correlation coefficient and n is the number of observations.

In Table 27 the correlation coefficients found in the study are listed with the highest correlations beginning at the top. When used alone (not in a predictive equation), the variables with the highest correlation coefficients indicate the best predictors of academic achievement in economics. The last column in the table describes the level of significance used for each variable. The .01 level indicates the coefficient was significant at the 1 per cent level of confidence; this result could not have occurred by chance more than once in 100 tries. The 5 per cent level of confidence (.05) means the result could not have occurred by chance more than 5 times in 100 tries.

The strongest relationship to academic achievement in economics was found with the following three variables:

1.	Freshman and sophomore GPA	.673
2.	Social science GPA	.528
3.	Elementary economics grade average	.522

The following variables were found to have a significant positive correlation to the criterion at the one per

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[5]Croxton and Cowden, Practical Business Statistics, p. 395.

cent level of significance.

1.	College mathematics	.457
2.	High school GPA	.410
3.	SAT Verbal Test	.364
4.	High school rank	.350
5.	Social studies GPA (high school)	.344
6.	Mathematics GPA (high school)	.316

TABLE 27

CORRELATION COEFFICIENTS FOR THE EIGHTEEN INDEPENDENT VARIABLES
N=92

Independent Variable	Correlation Coefficient (r)	Level of Significance[a]
Freshman and sophomore GPA	.67267	.01
Social science GPA	.52810	.01
Elementary economics grade average	.52156	.01
College mathematics GPA	.45736	.01
High school GPA	.41028	.01
SAT Verbal Test	.36406	.01
High school rank	.34966	.01
Social studies GPA (high school)	.34369	.01
Mathematics GPA (high school)	.31636	.01
Age	—.21576	.05
Sex	.20702	.05
Community college attendance	—.20580	.05
Semester of decision	—.12764	n.s.
SAT Mathematical Test	.11534	n.s.
Units of social studies	—.10001	n.s.
Hours of social sciences	—.06736	n.s.
Units of mathematics (high school)	—.05848	n.s.
Hours of mathematics (college)	—.01269	n.s.

[a]The level of significance was calculated from a table provided by Woodrow W. Wyatt and Charles M. Bridges, Jr. in Statistics for the Behavior Sciences (Boston: D.C. Heath and Co., 1967), p. 283.

A small positive correlation (significant at the five per cent level) for the sex variable indicated that female students did slightly better in economics than male students. A slight negative correlation (significant at the five per cent level) for the age and community college variables indicated that older students and community college transfers tended to have lower achievement levels in economics than their fellow students.

As a follow-up, correlation coefficients were calculated for the variables that could be extended into the junior and senior year. The cumulative GPA, social science GPA (excluding all courses in economics), mathematics GPA, and the semester hours of mathematics and social sciences after seven semesters of college work were used in a correlational analysis (see Table 28). The results tended to support the earlier findings (Table 27). The correlation coefficients for the semester hours of mathematics and social sciences were not found to be significant in the analysis of the data from this study. The correlation coefficient for the mathematics GPA increased over the value calculated from the freshman and sophomore data. The coefficient for the social sciences GPA remained relatively stable when seven semesters were included in the analysis. The cumulative GPA correlated highly with the dependent variable since the courses in economics were included in the overall college grade point average.

TABLE 28

CORRELATION COEFFICIENTS OF THE FOLLOW-UP VARIABLES AFTER SEVEN SEMESTERS OF COLLEGE
N=92

Independent Variable	Correlation Coefficient (r)	Level of Significance[a]
Cumulative GPA	.84429	.01
Social science GPA	.52620	.01
Mathematics GPA	.52384	.01
Hours of mathematics	.13104	n.s.
Hours of social sciences	.01657	n.s.

[a]The level of significance was calculated from a table provided by Woodrow W. Wyatt and Charles M. Bridges, Jr. in Statistics for the Behavior Sciences (Boston: D.C. Heath and Co., 1967), p. 283.

The Prediction Equation

A multiple regression equation is designed to use the independent variables to estimate the dependent or criterion variable. In this study one of the problems involved the development of a mathematical equation using the eighteen independent variables to predict the grade point average in economics.

Let us assume that the criterion variable is represented by Y, and the independent variables by X_1, X_2, X_3, ... X_{18}. Then the prediction equation can be written as follows:[6]

$$Y = c_0 + c_1X_1 + c_2X_2 + c_3X_3 \ldots + c_{18}X_{18}$$

The values for c_0, c_1, c_2, c_3,....c_{18} represent numerical constants which were determined by the method of least squares using the data from the study. In more specific terms c_0 is the constant added to the equation while c_1, c_2, c_3,....c_{18} represent regression coefficients which may be interpreted as the average change in the dependent variable associated with a unit change in the independent variable.[7]

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[6]John E. Freund, Modern Elementary Statistics (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1960), p. 323-24.

[7]Samuel B. Richmond, Statistical Analysis (New York: Ronald Press Co., 1964), p. 452-53.

After calculating the regression equation, the computer program calculated a multiple correlation coefficient. The multiple R indicated the correlation between the predicted grade point average in economics and the actual grade point average. In order to determine whether the multiple correlation coefficient was significantly different from zero, the F ratio was calculated.[8] The F ratio determined whether the R found in the study would be likely to occur by chance or whether it represented a significant multiple R. After deciding the appropriate level of significance, the actual F value was compared to a table of F values.[9] If the computed F was larger than the tabled value of F, then the multiple R was a significant value and the prediction equation was of value in predicting the criterion.

The computer program also furnished the R^2 factor. R^2 represented the proportion of the variance of the dependent variable which was explained by the predictor or independent variables. The contributions of X_1, X_2, X_3, ... X_{18} to the explained variance of Y were equal to the square of the multiple correlation coefficient.

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[8]George A. Ferguson, Statistical Analysis in Psychology and Education (New York: McGraw-Hill Book Co., Inc., 1959), p. 401.

[9]Ibid., p. 408-11.

The following symbols were given by for the variables in the regression equation:

Y = Criterion variable, the economics GPA
X_1 = Age of student
X_2 = Sex of student
X_3 = Community college attendance
X_4 = Semester of decision
X_5 = SAT Verbal Test
X_6 = SAT Mathematical Test
X_7 = High school GPA
X_8 = High school rank
X_9 = Social studies GPA
X_{10} = Units of social studies
X_{11} = High school mathematics GPA
X_{12} = Units of mathematics
X_{13} = Freshman and sophomore GPA
X_{14} = Grade average in elementary economics
X_{15} = Social science GPA
X_{16} = Semester hours of social sciences
X_{17} = Mathematics GPA
X_{18} = Semester hours of mathematics

Table 29 indicates the regression coefficients, the T values for the slope, and the standard deviation of the regression coefficients (standard error) for the prediction equation with eighteen variables. The letter c_0 represents the constant term added to the equation.

TABLE 29

DATA ON THE PREDICTION EQUATION
WITH EIGHTEEN VARIABLES

Variable	Regression Coefficient	T Values for Slope	Standard Deviation of Regression Coefficient
X_1	—.021978	—.52	.04
X_2	—.030786	—.14	.23
X_3	—.757069	—3.71	.20
X_4	.002586	.10	.03
X_5	—.000156	—.16	.00
X_6	.00032	.37	.00
X_7	.178281	.59	.30
X_8	—.004366	—.36	.01
X_9	—.053547	—.41	.13
X_{10}	—.079140	—1.60	.05
X_{11}	—.038137	—.24	.16
X_{12}	.052105	.48	.11
X_{13}	.642688	3.15	.20
X_{14}	.145679	1.33	.11
X_{15}	.193800	1.80	.11
X_{16}	.002586	.00	.04
X_{17}	.017454	.20	.09
X_{18}	.008214	.40	.02

$c_0 = 1.35$

Equation with eighteen variables. The following equation was developed using the group of eighteen independent variables to predict the GPA in economics.

$$Y = 1.35 - .02198X_1 - .03079X_2 - .75707X_3 + .00259X_4 - .00016X_5 + .00032X_6 + .17828X_7 - .00437X_8 - .05355X_9 - .07914X_{10} - .03814X_{11} + .05211X_{12} + .64269X_{13} + .14568X_{14} + .19380X_{15} + .00259X_{16} + .01745X_{17} + .00821X_{18}$$

The multiple correlation coefficient (R) for this equation was .7906. In order to verify the significance of the correlation coefficient, the F value was computed. At 18 and 73 degrees of freedom, the computed F value of 6.7614 exceeded the critical value of 2.28 at the one per cent level of significance. Thus the multiple correlation coefficient was significantly different from zero beyond the one per cent level. The proportion of the variance of the dependent variable accounted for by the equation (R^2) was .6251.

Simplification of the equation. A stepwise computer program from the Research Computing Center at the University of Massachusetts was utilized in this operation. The following is the general description of the program:

> This computes a sequence of multiple linear regression equations in a stepwise manner. At each step one variable is added to the regression equation. The variable added is the one which makes the greatest reduction in the error sum of squares. Equivalently it is the variable which has highest partial correlation with the dependent variable partialed on the variables which have already been added; and equivalently it is the variable which, if it were added, would have the highest F value. In addition, variables can be forced into the regression equation.

> Non-forced variables are automatically removed when their F values become too low. Regression equations with or without the regression intercept may be selected.[10]

This analysis means that the variables that enter after the first step are not necessarily in the order of the next highest correlation coefficient. The succeeding variables are added which have the highest partial correlation with the dependent variable partialed on the variables that have already been used. The result of this procedure is the development of an equation with a significant correlation coefficient using the least amount of variables. Thus this procedure has the advantage of making the prediction equation a more practical instrument.

The BMD 02R output included a correlation matrix, multiple R, R^2, standard error of estimate, F value, and a summary of the steps involved. The output was organized into steps, one step for each different prediction equation. At each step the prediction equation was increased by the addition of one variable.

The regression equation developed for the best single variable is given below:

$$Y = .51006 + .87662X_{13}$$

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[10] W.J. Dix, ed., Biomedical Computer Programs (Berkeley: University of California Press, 1968), p. 233.

The multiple correlation coefficient for this equation was .6727. The F value was computed at 74.379 which exceeded the critical value of 6.93 for F with 1 and 90 degrees of freedom at the 1 per cent level of significance. The proportion of the variance of the dependent variable explained by this equation was .4525. The freshman and sophomore GPA (X_{13}) added the entire .4525 to the explanation of the variance since it was the only variable used in the equation.

The regression equation for the best combination of two variables is given below:

$$Y = 1.09328 - .70651X_3 + .96141X_{13}$$

The multiple correlation coefficient for this equation was .7532. The F value was computed at 58.330 which exceeded the critical value of 4.85 for F with 2 and 89 degrees of freedom at the 1 per cent level. The proportion of the variance of the dependent variable explained by the equation was .5672. The addition of the community college variable (X_3) to the prediction equation added .1148 to the explanation of the variance of the dependent variable.

The regression equation for the best combination of three variables is given below:

$$Y = .96087 - .69068X_3 + .81657X_{13} + .19163X_{15}$$

The multiple correlation coefficient for this equation was .7690. The F value was computed at 42.442 which exceeded the critical value of 4.02 for F with 3 and 88 degrees of

freedom at the 1 per cent level. The proportion of the variance explained by the equation was .5913. The addition of the GPA in the social sciences (X_{15}) to the prediction equation added .0241 to the explanation of the variance of the dependent variable.

The regression equation for the best combination of four variables is given below:

$$Y = 1.18389 - .70457X_3 - .07307X_{10} + .80972X_{13} + .19961X_{15}$$

The multiple correlation coefficient for this equation was .7779. The F value was computed at 33.338 which exceeded the critical value of 3.54 for F with 4 and 87 degrees of freedom at the 1 per cent level. The proportion of the variance explained by the equation was .6052. The entry into the prediction equation of the units of social studies in high school (X_{10}) added .0139 to the explanation of the variance of the dependent variable.

The regression equation for the best combination of five variables is given below:

$$Y = 1.22976 - .76467X_3 - .08026X_{10} + .68121X_{13} + .14599X_{14} + .16969X_{15}$$

The multiple correlation coefficient for this equation was .7849. The standard error of the estimate was calculated at .4086, the lowest error for any of the prediction equations developed in the study. The F value was calculated at 27.591 which exceeded the critical value of 3.24 for F

with 5 and 86 degrees of freedom at the 1 per cent level. The proportion of the variance of the dependent variable explained by the equation was .6160. The addition of the grade average in elementary economics (X_{14}) in this step added .0108 to the explanation of the variance in the economics GPA.

In terms of efficiency and practical use of the predictive equation, it is not useful to add more than five variables to this equation. The largest increase in the explanation of the variance in the dependent variable came from the first two variables. Each additional variable added a smaller amount to R and R^2 than the preceding variable. The sixth variable added only .0025 to R^2. All variables beyond the fifth variable added less than .01 to R^2, therefore, no further equations were considered in the analysis. In most educational problems of this type, little advantage results from the addition of variables beyond this point.[11]

The program was organized into sixteen steps, one step and equation for each variable. However, two variables, semester of decision (X_4) and semester hours of social sciences (X_{16}), were not used by the stepwise program since

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[11] J. E. Wert, C. O. Neidt, and J. S. Ahmann, Statistical Methods in Educational and Psychological Research (New York: Appleton-Century-Crofts, Inc., 1954), p. 237.

they did not add a significant amount to the prediction equation. Table 30 shows the variables added in each step and the change in R and R^2. Table 31 illustrates the full combination of variables in each prediction equation developed in the sixteen steps.

TABLE 30

SUMMARY OF VARIABLES ADDED TO
THE PREDICTION EQUATION
IN EACH STEP

Step	Variable Added	R	R^2	Addition to R^2
1	Freshman and sophomore GPA (X_{13})	.6727	.4525	.4525
2	Community college (X_3)	.7532	.5672	.1148
3	Social science GPA (X_{15})	.7690	.5913	.0241
4	Units of social studies (X_{10})	.7779	.6052	.0139
5	Elementary economics (X_{14})	.7849	.6160	.0108
6	Age (X_1)	.7864	.6185	.0025
7	Hrs. of mathematics (X_{18})	.7880	.6210	.0025
8	Units of mathematics (X_{12})	.7886	.6218	.0009
9	High school GPA (X_7)	.7888	.6223	.0004
10	High school rank (X_8)	.7894	.6231	.0009
11	Social studies GPA (X_9)	.7898	.6238	.0007
12	Mathematics GPA (X_{17})	.7901	.6242	.0004
13	SAT Mathematical (X_6)	.7902	.6245	.0003
14	High school mathematics (X_{11})	.7904	.6248	.0003
15	SAT Verbal (X_5)	.7905	.6249	.0001
16	Sex (X_2)	.7906	.6250	.0001

TABLE 31

SUMMARY OF BEST PREDICTOR COMBINATIONS

Variables in Equation	Standard Error of Estimate	R	R^2
X_{13}	.4769	.6727	.4525
X_3X_{13}	.4264	.7532	.5672
$X_3X_{13}X_{15}$	.4167	.7690	.5913
$X_3X_{10}X_{13}X_{15}$	.4119	.7779	.6052
$X_3X_{10}X_{13}X_{14}X_{15}$	.4086	.7849	.6160
$X_1X_3X_{10}X_{13}X_{14}X_{15}$	.4097	.7864	.6185
$X_1X_3X_{10}X_{13}X_{14}X_{15}X_{18}$	.4107	.7880	.6210
$X_1X_3X_{10}X_{12}X_{13}X_{14}X_{15}X_{18}$	.4127	.7886	.6218
$X_1X_3X_7X_{10}X_{12}X_{13}X_{14}X_{15}X_{18}$	.4150	.7888	.6223
$X_1X_3X_7X_8X_{10}X_{12}X_{13}X_{14}X_{15}X_{18}$	.4171	.7894	.6231
$X_1X_3X_7X_8X_9X_{10}X_{12}X_{13}X_{14}X_{15}X_{18}$	.4193	.7898	.6238
$X_1X_3X_7X_8X_9X_{10}X_{12}X_{13}X_{14}X_{15}X_{17}X_{18}$	.4217	.7901	.6242
$X_1X_3X_6X_7X_8X_9X_{10}X_{12}X_{13}X_{14}X_{15}X_{17}X_{18}$	.4243	.7902	.6245
$X_1X_3X_6X_7X_8X_9X_{10}X_{11}X_{12}X_{13}X_{14}X_{15}X_{17}X_{18}$	.4268	.7904	.6248
$X_1X_3X_5X_6X_7X_8X_9X_{10}X_{11}X_{12}X_{13}X_{14}X_{15}X_{17}X_{18}$	.4296	.7905	.6249
$X_1X_2X_3X_5X_6X_7X_8X_9X_{10}X_{11}X_{12}X_{13}X_{14}X_{15}X_{17}X_{18}$	.4324	.7906	.6250

Summary

In summing up the correlation coefficients, the freshman and sophomore GPA had the highest correlation with the junior and senior economics GPA. Significant positive correlations were also found between the dependent variable and the social sciences GPA, elementary economics grade average, college mathematics GPA, high school GPA, SAT Verbal Test, high school rank, social studies GPA, high school mathematics GPA, and the sex variable. Negative correlations were found between age and community college attendance and the dependent variable.

In the second part of the analysis, a regression equation with the eighteen independent variables was calculated. The multiple correlation coefficient of .7906 for this equation was significant at the 1 per cent level. This combination of factors explained approximately 62.51 per cent of the variation in the GPA in economics for the students in the sample.

Since a prediction equation this large was statistically unnecessary and unwieldy for any practical use, the equation was simplified. It was found that an equation with five variables (the freshman and sophomore GPA, community college attendance, social sciences GPA, units of social studies, and the grade average in elementary economics) would be the most useful for predictive purposes. These five variables made the most contribution to the explanation of

the variance of the dependent variable. The addition of more variables beyond this point would be of no practical advantage. The combination of five variables yield a correlation coefficient of .7849 and explained 61.60 per cent of the variance in the economics GPA. This equation provided the lowest standard error of estimate (.4086) for any of the seventeen regression equations that were developed by the computer programs.

The results of the analysis in this chapter seem to indicate that variables obtained from student records can be used effectively to predict achievement in the upper-division economics curriculum.

C H A P T E R V

INFORMATION FROM THE QUESTIONNAIRE

An exploratory questionnaire was used to obtain data on the attitudes of the students in the sample and to reveal the relationship between these attitudes and academic achievement in economics. This chapter will be concerned with the design, testing, and results of the questionnaire.

Design of the Questionnaire

The construction of the questionnaire was begun with a study of the literature on attitude measurement and questionnaire design. It was decided to use a five-point Likert scale because of the high reliability of such instruments and the adaptability to the construction of a short questionnaire.[1] Students respond to a statement in this type of questionnaire by merely checking either "strongly agree", "agree", "uncertain", "disagree", or "strongly disagree". This simplification of the response enhances the return of the questionnaire by the students under study.

The next phase involved the selection of the items to

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[1]A. N. Opponheim, Questionnaire Design and Attitude Measurement (New York: Basic Books, Inc., 1966), pp. 133-42.

be used in the questionnaire. Specific items were initially accumulated from sources which included professional journal articles in economic education, reports of committees in economic education, and from the writer's own experience as a student and teacher of economics. The list of items was then shortened and reworded using suggestions from the Counseling Center at the University of Massachusetts and from several sources in the literature on questionnaire design.[2]

The questionnaire was so constructed that a high score would mean a positive attitude toward economics (i.e., the student would be highly interested in economics). To accomplish this end, all positive items were scored as follows:

5 = strongly agree

4 = agree

3 = uncertain

2 = disagree

1 = strongly disagree

Negative items were scored in the following manner:

1 = strongly agree

2 = agree

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[2]Allen L. Edwards, Techniques of Attitude Scale Construction (New York: Appleton-Century-Crofts, Inc., 1957), pp. 13-14; Melvin N. Freed, "In Quest of Better Questionnaires", Personnel and Guidance Journal, XLIII (October, 1964), 187-88; and Oppenheim, Questionnaire Design, pp. 49-78.

3 = uncertain

4 = disagree

5 = strongly disagree

Pre-test of the Questionnaire

The initial questionnaire was pre-tested on a sample of economics majors. The internal-consistency method of item-analysis was utilized to ascertain the suitability of each statement. In this procedure the correlation coefficients were calculated for each item with the total score minus the score for the item under consideration.[3] The formula and the discussion of correlation coefficients appear in Chapter IV. As a result of the item-analysis, twelve statements with the highest correlation coefficients were retained in the questionnaire. Later, a final item-analysis for the entire sample of questionnaires (N=71) confirmed the desirability of the retention of the twelve items in the questionnaire.

After the item-analysis was completed, the remaining twelve Likert-type statements and two open-end questions (see Appendix B) were tested for reliability. The reliability was checked by the test-retest method in which the

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[3]Oppenheim, Questionnaire Design, pp. 138-40.

degree of reliability is expressed as the coefficient of correlation between two sets of total scores.[4] In this case a retest was administered to the same sample after ten days had lapsed. A coefficient of correlation of .90 between the two sets of total scores was considered highly satisfactory.

The validity of the questionnaire was then checked by the known groups technique.[5] In this operation the questionnaire was administered to a group of undergraduate physics majors at the University of Massachusetts. The mean score of the physics group was then compared to that of a group of economics majors to verify that the two means were from different populations. The following formula for the t test was utilized:[6]

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{(N_1 - 1)\ S_1^2 + (N_2 - 1)\ S_2^2}{N_1 + N_2 - 2}} \cdot \sqrt{\frac{1}{N_1} + \frac{1}{N_2}}}$$

where X_1 and X_2 are the means and S_1 and S_2 are the standard deviations of the two samples of size N_1 and N_2. Since the computed t value of 3.85 exceeded the tabled t value at the

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[4]David Krech, Richard S. Crutchfield, and Egerton L. Ballachey, Individual in Society (New York: McGraw-Hill Book Co., 1962), p. 157.

[5]Ibid., p. 159.

[6]John E. Freund, Modern Elementary Statistics (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1960), p. 270.

one per cent level of significance, it was concluded that the difference between the means was significant. This indicated that the means were taken from different populations.

Administration of the Questionnaire

After the testing of the questionnaire, an attempt was made to contact all the students in the sample. Students registered for economics courses in their eighth semester were given a questionnaire in one of their classes. All other students were mailed a questionnaire with a letter requesting their cooperation. A second mailing was necessary as a follow-up for the non-respondents. Lastly, the remaining students who failed to respond to the earlier communications were visited in their dormitories. Seventy-eight per cent of the sample (seventy-one students) answered the questionnaire through one of the above methods.

Information Obtained

The twelve Likert-type questions and the two open-end questions were divided into six areas for the purpose of analysis. Item 1 and 3 concerned interest in economics in the freshman and sophomore year of college, item 2 and 4 dealt with the relevancy of the economics curriculum, item 5 and 7 related to interest in the economics curriculum, item 6 and 8 inquired into outside reading related to economics,

item 9 and 12 concerned the satisfaction in the selection of economics as a major field of study, and item 10, 11, 13, and 14 pertained to career intentions.

Freshman and Sophomore Interest

The wide distribution of responses for item 1 (Table 32) suggests that many students were not strongly committed to economics in their first two years in college. This is supported by the evidence in Chapter 3 (Table 7) which showed 75 per cent of the students had majored in another area before selecting economics as their major field. However, the majority of students (71.8 per cent) disagreed with item 3 which had suggested that the elementary economics courses taken in their freshman and sophomore year were boring.

TABLE 32

FRESHMAN AND SOPHOMORE INTEREST IN ECONOMICS
N=71

Response	Item 1[a]		Item 3[b]	
	Number	Percentage	Number	Percentage
Strongly agree	13	18.3	1	1.4
Agree	16	22.5	15	21.2
Uncertain	17	23.9	4	5.6
Disagree	18	25.4	37	52.1
Strongly disagree	7	9.9	14	19.7

[a]In my freshman and sophomore year of college, I was highly interested in economics.

[b]Elementary economics bored me most of the time.

Relevancy of Economics

Most students (67.6 per cent) agreed with the statement concerning the importance of understanding the economy. The majority of students (81.7 per cent) disagreed with item 4 which had suggested that economics was irrelevant to the real world. This seemed to indicate that most students were in accord with the merits of economic education.

TABLE 33

RELEVANCY OF ECONOMICS
N=71

Response	Item 2[a]		Item 4[b]	
	Number	Percentage	Number	Percentage
Strongly agree	14	19.7	2	2.8
Agree	34	47.9	4	5.6
Uncertain	9	12.7	7	9.9
Disagree	13	18.3	37	52.1
Strongly disagree	1	1.4	21	29.6

[a]The understanding of the economy should be of utmost importance to everyone.

[b]Most of the time, I feel that economics is irrelevant to the real world.

Interest in Courses in Economics

Item 5 and 7 (Table 34) were aimed directly at the perception of interest by the student in the economics curriculum. Only 24 per cent of the students felt economics courses were more interesting than any other courses that they had taken. On the other hand, 70.4 per cent disagreed with the statement that the courses had been dry and uninteresting. However, 25.4 per cent actually agreed with this statement which indicated that some students had little enthusiasm for the economics curriculum.

TABLE 34

INTEREST IN ECONOMICS CURRICULUM
N=71

Response	Item 5[a]		Item 7[b]	
	Number	Percentage	Number	Percentage
Strongly agree	5	7.0	3	4.2
Agree	12	17.0	15	21.2
Uncertain	17	23.9	3	4.2
Disagree	28	39.4	41	57.7
Strongly disagree	9	12.7	9	12.7

[a]Economics courses are more interesting than any other courses that I have taken.

[b]Most junior and senior level courses in economics have been dry and uninteresting.

Outside Reading

This set of statements (Item 6 and 8) dealt with interest in related economic problems found in literature not part of classroom assignments. Table 35 indicates many students were interested in reading additional material. This seems to denote that some students had a broader and deeper commitment to the understanding of economic issues than their fellow students.

TABLE 35

OUTSIDE READING RELATED TO ECONOMICS
N=71

Response	Item 6[a] Number	Item 6[a] Percentage	Item 8[b] Number	Item 8[b] Percentage
Strongly agree	6	8.5	6	8.5
Agree	27	38.0	23	32.4
Uncertain	9	12.7	4	5.6
Disagree	21	29.5	31	43.6
Strongly disagree	8	11.3	7	9.9

[a]I find the financial pages of the newspaper interesting.

[b]I seldom have time to read books or magazine articles on economic problems that are not assigned in class.

Satisfaction with the Choice of Economics

Table 36 shows some dissatisfaction with the choice of economics as a major field of study. Eighteen per cent of the students agreed that if they had it to do over again, they would major in another field of study. In addition to this, 25.4 per cent of the sample were uncertain in their response to this statement. However, in responding to item 12 only 9.8 per cent agreed that they were dissatisfied with their choice of economics, while 15.5 per cent of the students were uncertain.

TABLE 36

SATISFACTION WITH THE SELECTION OF ECONOMICS AS A MAJOR FIELD OF STUDY
N=71

Response	Item 9[a]		Item 12[b]	
	Number	Percentage	Number	Percentage
Strongly agree	5	7.0	2	2.8
Agree	8	11.3	5	7.0
Uncertain	18	25.4	11	15.5
Disagree	27	38.0	39	55.0
Strongly disagree	13	18.3	14	19.7

[a]If I had it to do over again, I would major in something else.

[b]I have been dissatisfied with the choice of economics as my major field of study.

Career

Only 15.5 per cent of the students indicated a desire to do graduate study in economics (Table 37). However, 66.2 per cent of the students felt economics would be important in their career. The response to this statement is difficult to interpret since it may indicate a feeling by students that economics will be important to their particular career, or it may simply represent the feeling that one's major in college will be important regardless of the area of concentration.

TABLE 37

CAREER INTENTIONS IN ECONOMICS
N=71

Response	Item 10[a]		Item 11[b]	
	Number	Percentage	Number	Percentage
Strongly agree	17	23.9	1	1.4
Agree	28	39.4	5	7.0
Uncertain	15	21.2	18	25.4
Disagree	6	8.5	36	50.7
Strongly disagree	5	7.0	11	15.5

[a]I do not plan to do graduate study in economics.

[b]Economics will be of little importance in my career.

The last two items consisted of open-end questions pertaining to career intentions. The answers were quantified by the following method:

6 = strongly related

5 = related

4 = somewhat related

3 = uncertain but somewhat related

2 = unrelated

1 = no plans

The category of "strongly related" consisted of those students who had plans for a career directly based upon their training in economics. These students planned graduate study in economics; to teach or do research in economics; or to enter some other area of professional economics. The related group contained students planning graduate study in business administration; to teach business or social studies; or to enter some career which would rely a good deal upon their background in economics. The somewhat related group consisted of students planning careers in law, as salesmen, or in general business. The last three categories are self-explanatory.

Table 38 summarizes the career plans of the students in the sample. Generally, there was a fairly wide distribution among the six categories. Since male students made up most of the sample, the effect of impending military service may have had some distorting effects upon career plans. It is interesting to note that only 9.9 per cent of the sample

indicated career plans that were strongly related to economics (actually, more students had plans to seek a MBA degree than to pursue graduate training in economics).

TABLE 38

THE RELATIONSHIP OF CAREER PLANS TO ECONOMICS
N=71

Categories	Number	Percentage
Strongly related	7	9.9
Related	15	21.1
Somewhat related	19	26.7
Uncertain but somewhat related	15	21.1
Unrelated	7	9.9
No plans	8	11.3

Correlational Analysis

The data from the questionnaire were keypunched onto IBM cards in this operation. The computer program was once more utilized to calculate the correlation coefficients.[7]

In the first step, a total score for the questionnaire

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[7]A complete discussion of correlation coefficients will be found in Chapter IV, pp. 65-68.

was calculated by adding the scores from the twelve Likert-type items. A correlation coefficient was then computed between the total score on the questionnaire and academic achievement in economics. A coefficient of correlation of .322, significant at the 1 per cent level, was calculated in this operation. This indicated that the total scores on the questionnaire correlated with academic achievement in economics.

In the next step, a correlation coefficient was calculated for the data on career intentions (item 13 and 14). The procedure established in Table 38 was employed to quantify the data for the computer program. A correlation coefficient of .389, significant at the 1 per cent level, was computed from the data in the study. Thus career intentions closely related to economics tended to be associated with higher grade point averages in economics.

In the last part of the correlational analysis, the degree of satisfaction with the choice of economics as a major field was compared to academic achievement in economics. The data used in this analysis was obtained from items 9 and 12 on the questionnaire. Students who indicated satisfaction with their choice of economics were assigned the number three (3), students who were uncertain were assigned the number two (2), and students dissatisfied were assigned number one (1). A correlation coefficient of .058 computed for this set of

data was not significant in this study. This indicated that for the sample under study, using the data above, there was no significant relationship between satisfaction with the choice of economics as a major field of study and academic achievement in economics.

Summary

The questionnaire was mainly exploratory in nature. Some of the findings may warrant further consideration. A fairly large number of students found the economics curriculum uninteresting (Table 34). Also, a sizable number of students were disappointed with their choice of economics as a major field (Table 36). Lastly, it seems interesting to note that not many students were planning careers as economists (Table 38).

The correlational analysis found a significant positive relationship between the degree of interest in economics (as measured by items 1 — 12) and academic achievement in economics. A positive correlation was also found between career plans in economics and achievement in economics. It should be emphasized again that the correlation coefficient does not indicate a cause and effect relationship, but measures rather the degree of association between the two variables. Therefore, further research into these factors is necessary to draw definite conclusions on the nature of this relationship.

C H A P T E R V I

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to determine the relationship of selected factors to academic achievement in economics. The study sought to develop a multiple regression equation using the selected variables to predict the probable achievement of students in the upper-division economics curriculum. This chapter presents a summary of the study, the conclusions based upon the findings, and recommendations.

Summary

The study sought answers to two major questions:

1. What is the relationship between the selected factors and academic achievement in economics?

2. What prediction equation would result from the study of the selected variables?

The study involved Bachelor of Arts degree candidates in economics, class of 1970, at the University of Massachusetts. The sample used in the study involved ninety-two students, who represented approximately ninety-five per cent of the seniors majoring in economics, at the university.

The major part of the data was collected from official records from the Department of Economics and the Office of the Registrar. In addition, a brief questionnaire was utilized

in a survey of the sample to explore attitudes toward the economics curriculum and career plans. The data was analyzed through the use of a multiple regression program by the Research Computing Center at the university.

Findings

The relationship between the selected factors and academic achievement in economics was analyzed by means of the correlation coefficient matrix computed by the regression program. The following variables correlated significantly with the criterion, a three-semester grade point average in economics: freshman and sophomore GPA (.673), social science GPA (.528), elementary economics grade average (.522), college mathematics GPA (.457), high school GPA (.410), career intentions (.389), SAT Verbal Test (.364), high school rank (.350), social studies GPA (.344), interest in economics (.322), high school mathematics GPA (.316), age (—.216), sex (.207), and community college attendance (—.206). The following variables individually did not correlate significantly with the criterion variable: semester of decision, SAT Mathematical Test, units of social studies, semester hours of social sciences, units of high school mathematics, and semester hours of college mathematics.

Seventeen regression equations were developed in the study using the variables above. It was found that a regression equation with five variables (the freshman and sophomore GPA,

community college attendance, social sciences GPA, units of social studies, and the grade average in elementary economics) would be the most useful for predictive purposes. That equation is given below:

$$Y=1.22976-.76467X_3-.08026X_{10}$$
$$+.68121X_{13}+.14599X_{14}+.16969X_{15}$$

This combination of five variables yielded a multiple correlation coefficient of .7849 and explained 61.60 per cent of the variance in the economics GPA. This equation provided the lowest standard error of estimate (.4086) for any of the seventeen equations that were developed in the study.

Conclusions

1. It was concluded that the variables used in the study are useful in the prediction of grade point averages in the upper-division economics curriculum. Furthermore, a combination of variables in a prediction equation was superior for predictive purposes to the use of any single variable.

2. The freshman and sophomore GPA was superior to all other variables used in this study in the prediction of the economics grade point average. Achievement in economics was more closely related to the freshman and sophomore GPA than any other variable used in the study.

3. Achievement in economics was more closely related to achievement in the social science area than to achievement

in mathematics. High school social studies and college social sciences were more highly correlated with achievement in economics than high school or college mathematics. In addition, the SAT Verbal Test was positively correlated to the criterion, while the SAT Mathematical Test did not correlate significantly with the economics GPA used in the study.

4. There was no significant relationship between the number of semester hours in the mathematics or social science area and academic achievement in economics. The best measure of academic potential in economics seems to be previous academic scholarship, rather than the magnitude of exposure to knowledge in certain areas.

5. Variables based upon grade point averages were more closely related to the criterion than any of the other variables used in the study.

6. The general picture of the data from the questionnaire seemed to indicate that a sizable number of students were disappointed with the economics curriculum at the University of Massachusetts. While the questionnaire was only exploratory, it did provide areas that should be investigated by the department.

Recommendations

1. It is recommended that the findings of this study should be used by undergraduate advisors in order to counsel potential majors in economics more adequately.

2. It is recommended that further research be conducted into the factors which appear to be related to achievement in economics in this study. Follow-up studies should be carried out to revise and bring up to date the multiple regression equations used in the prediction of academic achievement in economics.

3. Additional research should be conducted to determine the factors to which the variance not accounted for in the study may be attributed. There is a need for the measurement of student motivation and other non-intellective factors to determine their relationship to academic success in economics.

4. Further investigation is needed into the decision-making process by students in their choice of economics as a major field of study. There is a need for information on the rationale for the selection of economics as a major field by students, and its relationship to achievement in economics.

5. Future studies should investigate the possibilities for an alternative to the use of grades as the ultimate criterion for achievement in economics. Other measures of success in the field of economics need to be considered in

order to fully understand the purpose of the economics curriculum.

APPENDIX A

THE ECONOMICS CURRICULUM

125. Elements of Economics

126. Problems of the National Economy

201. Intermediate Microeconomic Theory

211. Money, Banking and Credit

212. Money, Income and Monetary Policy

214. Macroeconomic Theory and Business Cycles

221. The International Economy

222. International Trade and Economic Policy

231. Social Control of Business

232. The Structure of American Industry

241. Labor Problems

242. Labor Law and Legislation

251. Mathematical Methods in Economics

252. Econometrics

261. European Economic Evolution

262. American Economic History

266. Economic Development

267. Latin American Economic Development

271. Comparative Economic Systems

272. The Soviet Economy

281. Regional Economics

282. Urban Economics

301. Decision Theory in Economics

304. Financial Aspects of Economics

306. Development of Economic Thought

312. Public Finance

314. State and Local Public Finance

341. Economic Security

362. Technology in Western Civilization

APPENDIX B

THE QUESTIONNAIRE

The following information will be confidential and used only for research purposes.	Strongly Agree	Agree	Un-Certain	Dis-Agree	Strongly Disagree
1. In my freshman and sophomore year of college, I was highly interested in economics.					
2. The understanding of the economy should be of utmost importance to everyone.					
3. Elementary economics bored me most of the time.					
4. Most of the time, I feel that economics is irrelevant to the real world.					
5. Economics courses are more interesting than any other courses that I have taken.					
6. I find the financial pages of the newspaper interesting.					

	Strongly Agree	Agree	Un-certain	Dis-Agree	Strongly Disagree
7. Most junior and senior level courses in economics have been dry and uninteresting.					
8. I seldom have time to read books or magazine articles on economic problems that are not assigned in class.					
9. If I had it to do over again, I would major in something else.					
10. I do not plan to do graduate study in economics.					
11. Economics will be of little importance in my career.					
12. I have been dissatisfied with the choice of economics as my major field of study.					

13. What are your career plans?_____

_____

14. What do you think you will be doing five years from now?

_____

_____

name or student number

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